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Zhodnocení makroobezřetnostní a monetární politiky v Číně

Assessment of the Macroprudential Policy and the Monetary Policy in China

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List of Annexes
Annexes

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Content:

1 Introduction 5

2 Characteristic of Macroprudential Policy and Monetary Policy 6

2.1 Macroprudential Policy 6

2.1.1 Background of Macroprudential Policy 6

2.1.2 Theoretical Basis of Macroprudential Policy 8

2.1.3 The Objective of Macroprudential Policy 9

2.1.4 The Instruments of Macroprudential Policy 11

2.1.5 The Structure of Macroprudential Policy 14

2.2 Systemic Risk 15

2.2.1 Accumulation of Systemic Risks 15

2.2.2 Outbreak of Systemic Risks 16

2.2.3 Spread of Systemic Risks 16

2.2.4 Systemic Risk Comparison 17

2.3 Monetary Policy 17

2.3.1 Monetary Policy Objective Theory 18

2.3.2 The Instruments of Monetary Policy 20

2.3.3 Evaluation of Monetary Policy 21

2.3.4 Unconventional Monetary Policy 22

2.3.5 Channels of Monetary Policy 23

3 Characteristic of the Interaction of Macroprudential Policy and Monetary Policy 25

3.1 The Background of Relationship between Macroprudential Policy and Monetary Policy 25

3.2 The Interaction of the Policy Objectives 27

3.3 The Interaction of the Policy Instruments 30

3.4 Policy Portfolio Design 31

4 Empirical Analysis of Interaction of Macroprudential Policy and Monetary Policy in China 33

4.1 Macroprudential Policy and Monetary Policy in China 33

4.1.1 Macroprudential Policy in China 33

4.1.2 Monetary Policy in China 34

4.1.3 Double-pillar Framework in China 35

4.2 Macroeconomic Variables in China 37

4.2.1 Description of Gross Domestic Product 37

4.2.2 Description of Inflation Rate 39

4.2.3 Description of Volume of Credit 40

4.3 Description and Analysis of Monetary Policy Tools and Macroprudential

Policy Tools **41**
4.3.1 Description and Analysis of Monetary Policy Tools *41*
4.3.2 Description and Analysis of Marcoprudential Policy Tools *43*
4.4 Analysis of Interaction of Monetary Policy and Macroprudential Policy in China **45**
5 Conclusion **50**
Bibliography **51**
List of Abbreviations **54**
Declaration of Utilisation of Results from the Diploma Thesis
List of Annexes
Annexes

1 Introduction

After experiencing financial crisis of 2007, economists realized that relying solely on monetary policy (MP) was not enough to maintain economic and financial stability. Under such circumstances, macroprudential policy (MPP) has emerged and became to be an important policy aimed on ensuring financial stability.

The objective of this thesis is to make the assessment of the interaction between China's MPP and MP from 2007 to 2016 by using the related economic data and policy indicators.

This thesis is divided into five parts. The first part intrudes the selected topic, and describes the aim of this thesis, its structure and the brief contents of each chapter.

In the chapter 2 there is description of MPP and MP. We introduce the theoretical background about these two policies, further the policy instruments, evaluation and transmission channels in order to help us to understand the objectives of MPP, we also introduce and describe the concept of systemic risk.

In the chapter 3, we describe the interaction between MPP and MP according to the background of their relationship, the interaction of the policy objectives and the interaction of the policy instruments. Based on this information, the proposals for a policy portfolio design are presented.

In the chapter 4, we introduce basic information about implementation of China's MPP and MP. It includes the development of MPP in China, the double-pillar framework and the macroprudential assessment system (MPA). In addition, we characterize the China's so called steady MP, which conduction is different from other countries. Finally, we make the analysis of the interaction of MP and MPP in China based on the macro-economic variables such as gross domestic product (GDP) and inflation rate, and the policy tools, such as adequacy ratio, provision coverage and deposit reserves ratio.

The last chapter is conclusion. In this chapter we summarize the results from the empirical part of the thesis and write the conclusions.

2 Characteristic of Macroprudential Policy and Monetary Policy

It is important to study MPP and MP nowadays. MPP and MP are both important policies, which can influence financial stability. Especially after the global financial crisis of 2007, MPP became very useful to keep the safety and stability of financial system.

In this chapter, we will introduce the basic information about MPP and MP, which include their framework, aims and instruments. This chapter consists of three sub-chapters; the first one describes MPP, the second part is focused on the MP, and the last part refers to systemic risks.

2.1 Macroprudential Policy

MPP aims to identify and mitigate risks for the robust stability of financial system, such as credit provision, insurance, payment and settlement services. The main goal of MPP is to limit systemic risk and work closely with other policies to help them accomplish their goals (Viñals, 2011).

In the next five parts, we will describe the background, theoretical basis, objective, instruments and structure of MPP.

2.1.1 Background of Macroprudential Policy

Macroprudential regulation is the approach to financial regulation that aims to mitigate risk to the financial system as a whole. In the aftermath of the late-2000s financial crisis, there is a growing consensus among policymakers and economic researchers about the need to re-orient the regulatory framework towards a macroprudential perspective (Krishnamurti, 2014).

As documented by Clement (2010), the term '*macroprudential*' was firstly used in the late 1970s in unpublished documents of the *Cooke Committee* and the *Bank of England* (Li, 2013). But only in the early 2000s, after two decades of recurrent financial crises in industrial and, most often, emerging market countries, the macroprudential approach to the regulatory and supervisory framework has become increasingly promoted, especially by authorities of the *Bank for International Settlements* (BIS). A wider agreement on its relevance has been reached as the result

of the late-2000s financial crisis.

At the same time, MPP has gradually gone beyond the scope of financial regulation to form a MPP and has been used broadly to refer to policies that address systemic risk and all the topics related to the interaction of macroeconomic and financial stability (Li, 2013).

We have already known that the term "*macroprudential*" became important after the crisis of 2007, so if we want to know the reason why it is so, we should understand the causes of this crisis at first.

There are two main reasons, among others. The first one is the positive feedback characteristic of financial system, popularly speaking, it is the financial system's procyclicality. For example, when people are trapped in an economic bubble and suffer from money illusion. Economic bubble means that the transaction price of capital exceeds its intrinsic value. The reasons for this are driven by many factors, such as the real value of the assets, or when people are optimistic about the future market due to information asymmetry or changes in government policies, asset prices will be pushed up and economic bubbles may generate. However, people will be aware of the existence of an economic bubble. When the bubble crashes, people fear to lose more money, they will sell assets, asset prices will fall and hurt the holders. However, good supervision will stop the process at some point of time, it prevents the occurrence of injury. In order to prevent financial crisis, we need to reduce the procyclicality of financial systems (Li, 2013).

The second reason is related to the effect of systemically important financial institutions (SIFIs). These are the so called 'too big to fail' financial institutions. SIFIs are generally large and complex companies or banks that have a significant presence in the industry and are considered to require government regulation in order to avoid bankruptcy or insolvency. The bigger this type of company, the greater the damage done by its failure because such a company is connected to many other financial institutions, and has a lot of employees, which may lose their jobs and incomes. Thus, when the costs of help (bailout) are smaller than the loss caused by such a company's collapse, the government might provide an assistance. However, there are still many

open questions and problems related associated with this system. For example, how to define SIFIs? Do the SIFIs competitors need protection, those smaller banks? Who pays for the potential bailout of SIFIs, e.g. taxpayers? Will it create greater burdens on the people? More seriously, the SIFIs system may pose a serious moral hazard, reduce market discipline, and encourage more risky behavior. Both the SIFIs itself and the competitors of the SIFIs may make some inappropriate decisions because of the existence of SIFIs system (Kaufman, 2014).

In the past, it was assumed that these financial crises would not emerge if the MP goals were met but after the crisis of 2007 people realized that even if there is a crisis in individual institutions, the risk may spread to entire financial system through their interconnectedness. At this point, MPP applies when MP is not sufficient to prevent systemic risks (Li, 2013).

Nowadays, central banks of many countries use MPP to prevent the financial crises, and that is the reason why it makes sense to study MPP.

2.1.2 Theoretical Basis of Macroprudential Policy

Before the crisis in 2007, the theoretical basis of the mainstream financial supervision theory was new classical economics.

The focus of new classical economics is on the homo economics' objective to maximize his/her personal utility. Based on this assumption the investors are always rational, the market is always efficient, and it will keep in Walrasian equilibrium all the time. What the financial supervision can learn from the new classical economics is that the supervision in financial markets should be minimized. The reason for this is that with the assumption of Walrasian equilibrium and rational economic agent, the signals from the market are always correct and effective, thus, market discipline can control for many risks.

Moreover, we can use the market itself to eliminate those banks with potential problems, banks without potential problems will continue to operate. Financial institutions with a high level of risk management will not develop financial products that are overly risky, and consumers who have full access to information will only choose the product that best suits to them. The entire market can run perfectly (Li,

2013).

However, this theory is invalid in the real financial markets. Because the personal behavior of economic agents always cannot satisfy the hypothesis of their economic rationality. In this case, financial market is not always efficient. In fact, financial market fails to work efficiently in lot of times, due to the limited arbitrage effect, the market price of securities often does not reach a rational equilibrium level, and the effective market hypothesis is difficult to achieve (Barberis and Thaler, 2003).

In addition, even though the personal behavior is rational, we cannot be sure that the financial market is rational as a whole, and we call this situation as '*fallacy of composition*'. Fallacy of composition could be described as a situation when people see a part of a thing, they rely on the knowledge of what they see, and they assume that the whole thing is the same as this part. For example, a blind person wonders what an elephant looks like He/she went to touch an elephant, only touched the elephant nose, and asserted that the elephant is a very thick rope.

Another reason why financial market might not be rational is the "*herd effect*". Herding behavior could be described as a situation when people are easily influenced by other people around them and behave in a similar way. For example, if your friend, your family members or your neighbor tells you that some stock is a good investment, you may buy this stock without your own judgement, and think that this is the right behavior (Li, 2013).

2.1.3 The Objective of Macroprudential Policy

The MPP aims to ensure the stability of the financial system as a whole and to ensure that the financial sector makes a sustainable contribution to economic growth by strengthening the flexibility of financial system and by preventing and diminishing systemic risks. The objective of MPP consists of two parts: counter-cyclical and prevent systemic risks, and we will introduce systemic risk later. In other words, it addresses the time dimension and the cross-sectional dimension of systemic risks (Li, 2013).

When talking about the time dimension, systemic risk is extended by the interaction between financial system and real economy, which is pro-cyclical. There

could be a feedback effect between the financial system and real economy. When the economy is booming, the financial institutions' ability to take risks increases, increasing leverage and asset prices cause over-growth in the size of financial institutions' balance sheets. They can provide more credit and stimulate economic activity. When there is a bust of economic activity, financial institutions suffer from the credit losses, they are reluctant to grant new loans and their balance sheets shrink, making the downturn of economic activity deeper.

To sum up, pro-cyclicality of financial intermediation could result in a greater amplitude of business cycle. Therefore, in the case of time dimension of systemic risk, the main objective of MPP is to curb the pro-cyclicality of financial system and to improve its resilience (Li, 2013).

Regarding the cross-sectional dimension of systemic risks, the key question is how to deal with common and related risk exposures among financial institutions. These risks are usually due to the interconnectedness of business activities among fin institutions. As was mentioned earlier, there is a "fallacy of composition" in operation of the financial system.

If there is some shock to financial system and first impacted institution emerged, it could decide to resist the shock by selling its assets. However, this approach becomes ineffective if all institutions decide to sell their holdings of assets as well. This could have negative effects on assets prices when the so-called fire-sell of assets causes sharp decline in their prices.

Therefore, when the financial system encounters external shocks, systemic risks are easily triggered by the "herd effect". Therefore, from this perspective, we should try our best to keep such risks within a narrow range, especially the tail risk, by the way, we have better to explain what tail risk is, that is, some of the less frequent, but the impact of huge events. Because financial institutions are unable to withstand the damage caused by tail risk, we must take precautions regardless of the probability of tail risk occurring.

The risk of a cross-sectional dimension measures the cumulative risk in the financial system at a point in time; the risk in a time dimension measures the accumulation of risks within the system during some period and its eruption at some point (Wen, 2009).

2.1.4 The Instruments of Macroprudential Policy[1]

In this part, we will introduce the instruments of MPP. Compared with micro-prudential regulation, macroprudential regulation focuses on the stability of the entire financial system. The main tools of MPP include six parts, we will introduce them one by one.

- **Regulation for liabilities maturity and capital liquidity**

After the financial crisis of 2007, people realized that they should not only pay more attention to the volume of liabilities of financial institutions, but also pay more attention to the duration of these debts because most of the liability, deposits and commercial bonds which quit were short-term when the global financial crisis occurred. This reduces the bank's ability to take and manage risks.

In addition, in the event of a financial crisis, due to short-term investment withdrawals, banks that previously over-relied on short-term liabilities sold some assets in exchange for more funds, with multiple banks selling at the same time. This resulted in the substantial drop in asset prices. Thus, as the reaction, the Basel Committee on Banking Supervision has set up the net stable funding ratio (NSFR), which requires banks to hold a certain amount of long-term debt in their capital structure.

- **Requirements for higher quality capital**

Compared with the preferred stock, when the company suffers a loss, the common stock will always be relied upon for compensation. The presence of a large number of preferred stock will make the common stock investor worried about taking the loss, and they could decide not to invest; therefore, it could be more difficult for company to issue the stocks. Therefore, the company needs to be required to hold a

[1] *The sub-chapter 2.1.4 is inspired by Li (2013).*

certain amount of common stock, and in calculating the capital adequacy ratio, it needs to use some assets that can be converted into common equity.

What needs to be mentioned is the Basel III Accord on capital adequacy requirements. This accord has raised the demand for capital adequacy but there are many factors that affect the capital adequacy ratio (CAR). There are four main aspects.

Firstly, under the Basel Accords, the rise in the non-performing loans (NPL) ratio will increase the riskiness of assets of the banks, thereby reducing the capital adequacy of commercial banks, of course, if bank' s total loans decline, the NPL ratio of this bank will decrease too, but they are the same in sense, it is the ability of loans supply of this bank is worse than past, so for a bank, pursue smaller NPL ratio is always right.

Secondly, higher profitability of commercial banks means that commercial banks can use more retained earnings to convert into capital. Thus, if the riskiness of assets does not change, the bank's CAR will be significantly raised.

Thirdly, the bank's CAR will also change with the change in the size of assets. In China, state-owned commercial banks have higher capital adequacy ratios than other commercial banks (Li, 2013).

Finally, there is an important role of economic cycle; in theory, the CAR of commercial banks and the business cycle is positively correlated. When the economy downturn, more borrowers are unable to repay the loan, the non-performing loan ratio rises, causing the CAR to drop. Due to regulatory requirements for the bank's capital adequacy ratio, the declining CAR will reduce the bank's credit supply and reduce its expansion capacity, aggravate economic recession (Wen, 2009). That why they are positively correlated

- **Focus on the amount of capital rather than the capital ratio**

For some banks with insufficient capital adequacy ratio, we should limit the remuneration of managers, prohibit the acceptance of interbank deposits and promote the bank to raise the CAR. However, some banks prefer to reduce the denominator of CAR, which represents the risk-weighted assets, instead of increasing the numerator,

i.e. acquiring more capital to meet the regulatory requirements for capital adequacy ratio. For such a bank, the higher amount of capital required will be more effective way how to rise CAR. Because our goal is to allow banks to guarantee its ability to supply credit and solvency, even if banks deleverage and reduce his risk assets, their ability to provide credit will decline too, so increase capital is the best way to rise CAR.

- **Regulation of shadow banking system**

Shadow banking refers to non-bank intermediaries that provide similar financial services to traditional commercial banks and has become a gray area of the financial environment. Sometimes it becomes the trick by which individual banks evade regulation and confuse investors. It included securitization vehicles, asset-backed commercial paper, money market funds, market for repurchase agreements, investment banks and mortgage companies (Bernanke, 2013).

Macroprudential regulation is different from the micro-level, and it is more concerned about the entire financial system; thus, the supervision and regulation of shadow banking activities is positive in the way that we can effectively avoid the existence of gray areas, but we can better achieve the policy objectives and stabilize the economy as well.

- **Contingent capital instruments**

Contingent capital instruments include reverse convertibles and contingent convertibles and capital insurance. The first two types of instruments mean that when the market value of a bank drops below the limit, the bond issued by the bank can be automatically converted into equity. Capital insurance means that when a specific event occurs, the contractor pays the appropriate amount to replenish the capital.

For the bank, these kinds of instruments have the lower cost than common stocks but higher cost than bonds. In this way, the banks can guarantee that there will be enough equity capital to absorb losses during the crisis and avoid issuing large stocks as capital buffers in times of economic success, resulting in a decrease of profitability. Thus, banks will be willing to accept them if the superintendent take these accounts to the regulatory capital measure.

- **Provision coverage ratio**

Provision coverage ratio refers to the ratio of all loan reserves of commercial banks to their NPL, which is an important indicator to reflect whether the commercial bank can bear the losses caused by NPL in the future, and the provision fund is derived from profits. The higher the provision coverage ratio, the stronger the ability of the bank to bear the loss in the future. However, excessive provision coverage means that more funds are limited and cannot be used for profit, this is a waste. Therefore, it is very important to find a proper provision coverage ratio. In China, the ideal value of the provision coverage ratio is around 150%.

2.1.5 The Structure of Macroprudential Policy

There are three factors of the macroprudential structure, they are macroprudential analysis, MPP instruments and MPP arrange.

Macroprudential analysis is focused on detection and assessment of risks in the financial system. According to the risk sources of the financial system, the risk warning is issued to provide the information basis for MPP. There are four main models which can be used for assessing the risk relevance of financial institutions; these are the following: network model, crisis dependency matrix model, CO-RISK model and default intensity model (Li, 2013).

MPP toolkit is a set of feasible instruments to prevent risks to become systemic risks, as well as how to use these tools, how to judge the effectiveness of the policy (Viñals, 2011).

Regarding the MPP arrange, representatives of central banks, financial circles and regulation and supervision institutions all need to take part in and make the team work to ensure financial stability. We can document it relevance with the following words of José Viñals:

"The institutional architecture of MPP, including mechanisms of governance, accountability, and transparency; and coordination of MPP with other public policies aimed at preserving financial stability." (Viñals, 2011, p.12).

A well-defined macroprudential framework should ensure the realization of three objectives. The first one is to improve risk management of large-scale

institutions, further to formulate counter-cyclical policies and limit exposure of inter-bank transaction risks. The second one is to provide appropriate and accurate public information in time, which is necessary for both investors and regulators. Finally, macroprudential policies need to be coordinated with monetary policies. The reason is the existence of information asymmetry and policy lags.

2.2 Systemic Risk

As it known to all, the primary objective of the MPP is protecting the financial sector from the systemic risk, so we need to know what systemic risks are.

If an event occurs that will cause most institutions in the financial system to lose confidence and be severe enough to adversely affect the entire financial system, then we call this a systemic risk. Its essence is the risk of bad events in the financial system. The consequences of it are often much more serious than the failure of a single financial institution (Hendricks, 2009).

There are three stages of systemic risk; these are as following: accumulation, outbreak, and spread of systemic risks (contagion).

2.2.1 Accumulation of Systemic Risks

Systemic risks always have a long accumulation process, what means that systemic risk can accumulate over a long period of time without impacting on the financial environment. However, when it materializes after the phase of accumulation, it can have serious adverse impacts on financial sector and real economy. Paying attention to systemic risk accumulation is more important than focusing on the financial crisis itself, because it is easier to solve the problem from the source than solve the problem when they occur. We will illustrate the evolutionary process of the systemic risk in Tab 2.1.

Table 2.1 Common Evolutionary Process of the Accumulation of Systemic Risk

1ST stage	Investor is expected to optimistic
2nd stage	Willing to take more risk
3rd stage	Increase investment
4th stage	Expended risk exposure
5th stage	Leverage increased
6th stage	Financial institutions become vulnerable
7th stage	Systemic risk is accumulating

Source: Self-elaboration based on Hendricks (2009)

After this process, systemic risk accumulated, financial sector will be weaker and weaker. Until the materialization of the systemic risk.

2.2.2 Outbreak of Systemic Risks

When systemic risks accumulate to a certain extent, some unexpected events might occur. For example, when one financial institution goes bankrupt, the central bank suddenly tightens the money supply and the asset price bubble bursts, such as events could be triggers for systemic risks.

The traditional view that a systemic crisis starts with the collapse of a single financial institution which is systemically important, and triggers a crisis of repayments and, in turn, spreads to other financial institutions, and so we think the initial booster of a risk explosion is exogenous. Subsequent studies suggest that most institutions in the financial system will be affected in the event of problems by holding the same financial instruments for most of the seasons and exposing them to the same risk exposures. In other words, the booster may also be an internal factor.

2.2.3 Spread of Systemic Risks

The spread of systemic risk is the main reason for the financial crisis. The impact of systemic risk will cause the assets of financial institutions to shrink substantially, which in turn will erode profits and capital of financial institutions, exacerbating asset sales and price declines. For the indebted parties, the normal funding channels of financial institutions can no longer be used. The outflow of funds

could lead financial institutions into a liquidity crisis and insolvency. Generally, the more developed are financial markets, the greater is the spread of systemic risks. Tab. 2.2 will show us the spread of systemic risks, it is following:

Tab. 2.2 Spread of Systemic Risks

1st stage	After the risk accumulates to a certain extent, the financial institutions are harmed
2nd stage	A few banks went bankrupt or loss money
3rd stage	Many banks went bankrupt or loss money
4th stage	Financial crisis

Source: Self-elaboration based on (Li, 2013)

2.2.4 Systemic Risk Comparison

The Tab. 2.3 shows the traditional and the current view on systemic risk. The differences are as following:

Tab. 2.3 Comparison of Different Views on Systemic Risk

Traditional view	**New view**
The financial system is inherently fragile and there is no risk-accumulation process	The accumulation of systemic risk is more important than the fuse of a crisis
The crisis starts with the collapse of a single financial institution	Risk outbreak starts when the same risk exposures held by financial institutions
The risk-diffusion mechanism is endogenous, but the initial impact is exogenous	Systemic risk is endogenous, including the risk-diffusion and initial impact
The channel of risk diffusion is the high correlation of the financial institution's balance sheet	There are many channels for spreading the risks

Source: Self-elaboration based on Zhang (2010)

2.3 Monetary Policy

MP is really an important and necessary part of the macroeconomic policies. In this sub-chapter we will describe MP objective theory, instruments of MP, evaluation of MP and unconventional MP.

2.3.1 Monetary Policy Objective Theory

In the monetary objectives system, there are three kinds of objectives: operating objective, intermediate objective and final objective (Li, 2013).

When we define an operating objective, we should ensure these three requirements: it should be controlled, predictable and relevant. Operating objective is used for affecting an intermediate objective in order to fulfill a final objective. When we set up an intermediate objective, the requirements are almost the same compared to operating objective, however, there is one more requirement: anti-interfere performance. Final objective is an objective which the MP wants to fulfill in a long-run period.

There are four possible final objectives of MP. These are as following: price stability, full employment, economic growth and balance of payments (Li, 2013).

It is impossible to achieve the four final goals of MP at the same time because of the constraints among these objectives. Sometimes there is a conflict between the two goals. For example, if we want to secure employment, we need to protect the existing jobs. If we want to promote economic growth, we need to encourage technological innovation. Sometimes, however, science and technology will replace labor force as a productive force. And new technology requires less staff than traditional industries, causing many workers in traditional industries to lose their jobs, so central bank has to choose. It is worth mentioning that since the 1990s, inflation targeting has emerged and has become the most popular MP objective. We can see the final objectives of MP in different (selected) countries in Tab. 2.4.

From the Tab. 2.4, we can see the three types of target systems, the first one is the single target system and the second one is dual target system, the last one is multiple target system.

Tab. 2.4 Final MP Objectives of Selected Countries

Country	Target system	Specific goals
China	Dual target system	Stabilize prices and promote economic growth
United States of America	Multiple target system	Take into account price stability and full employment, and stimulate economic recovery
England	Single target system	stabilize prices
France	Single target system	stabilize prices
Germany	Dual target system	stabilize prices and promote economic growth

Source: Self-elaboration based on Li (2013, p.40)

China and Germany choose the dual target system, because they select stabilize prices and promote economic growth as their MP goals. And England and France choose the single target system, because they select stabilize prices as their monetary goal, and the America choose the multiple target system, they select price stability and full employment and stimulate economic recovery as their monetary goals.

The policy makers who use single target system believe that with no respect to the phase of business cycle, they just need to set up only one MP final objective because it is more suitable for achieving the objective. And there are two main objectives, they are economic growth target system and price level stable target system, policy maker has to choose one of them to be the single target.

However, the policy makers who use dual target system believe that the MP objective which set up by the central bank should not be single in different period. Unlike the single target system, which pays attention to either economic growth or price stability, the dual target system considers these two objectives together (Li qiong, 2009).

2.3.2 The Instruments of Monetary Policy

We will introduce universal MP instruments in this part. There are three basic instruments and they are: reserve requirements, re-discount policy and open market operations (Li, 2013).

- **Reserve Requirements**

The reserve requirements refer to the central bank ask the commercial bank to deposit the money in the central bank account according to a certain percentage of the deposit of the commercial bank. The purpose of this instrument is to ensure that commercial banks have sufficient level of liquidity in an event of a sudden and substantial withdrawal of bank deposits.

Central bank can influence money supply by changing reserve requirements. When the central bank want to increase money supply, it can reduce the reserve requirements, because the reserve requirements have dropped, banks have more money to provide loans, borrowers are also easier to get money, which is equivalent to increasing the market circulation of currency, increasing the money supply; on contrary, if the central bank wants to decrease money supply, is just need to increase reserve requirements, because banks' ability to provide loans diminishes as reserve requirements rise, the amount of money circulating in the market declines, it means money supply has dropped.

Since the 1930s, the reserve requirements system has become an important mean for the government to regulate the economy. It is a system by which the central bank influences the credit size of commercial banks. This system stipulates that commercial banks cannot use all deposits they acquired in the form of newly granted loans, i.e. they have to deposit a certain proportion of them in the central bank.

In many developed countries, the instrument of reserve requirements has been gradually phased out or used for other reasons. However, reserve requirements remain a very common MP tool in developing countries. As reported by Fungacova, Nuutilainen and Weill (2015), in year 2007, the reserve requirements were adjusted 10 times, and from 2008 to 2013, the reserve requirements were adjusted 24 times.

- **Re-discount Policy**

The re-discount rate is the interest rate of the central bank on commercial banks or other financial institutions. If the central bank wants to reduce the money supply and shrink credit, it should increase the re-discount rate, which will increase the cost of commercial banks' financing in central banks and reduce the amounts of commercial banks' funds. As a result, commercial banks give their clients' money and investment will be reduced, which will lead to a reduction in the supply of money on the market. If we want to stimulate economic growth and expand investment, central bank should reduce the re-discount rate.

- **Open Market Operations**

Open market operations refer to the central bank purchase or sale of securities, affect the amount of money circulating in the market through open market operations, regulating of the money supply, Unlike the securities traded by ordinary financial institutions, the purpose of buying and selling securities by the central bank is not for profit but to regulate money supply. According to the development of the economy, when central bank deems it necessary to reduce monetary base, it sells securities and recovers accordingly a portion of its base currency to reduce the amount of funds available to financial institutions. On contrary, when central bank deems it necessary to ease its MP, it buys securities, and expand and directly increases the amount of funds available to financial institutions (Li, 2013).

2.3.3 Evaluation of Monetary Policy

The effect of MP refers to the degree of change in aggregate demand and total income levels caused by MP. Whether the effectiveness of MP is significant depends on the following three factors.

- **Lag of Monetary Policy**

Changes in MP usually take time to affect the economy. Time lag may be between nine months and two years. Fiscal policy and its impact on output is relatively short. When MP attempts to stimulate the economy by lowering interest rates, it can take up to 18 months for signs of any improvement in the economy (Li, 2013).

- **Psychological expectations of micro-subjects**

When the MP is implemented, the micro-entities will predict and react according to the information obtained, which may make the MP ineffective. For example, when people expect the inflation rate to be consistent with that of the previous period, companies will think that the price of their products will rise so that the worker willing provide more labor and the number of commodities will rise, because people are willing to provide more labor, manufacturers are willing to provide more goods, employment rates rise. Making the MP effective in short-run. However, in the long run, people will not make this mistakes, manufacturers and laborers will find that the prices of their products and services do not rise after considering inflation, MP is invalid.

- **Cooperation of Monetary Policy and Fiscal Policy.**

Monetary and fiscal policies are two basic tools for the state. They mainly adjust the relationship between aggregate supply and aggregate demand through expansionary and contractionary policies. These two policies must be properly used in order to bring about more coordinated cooperation (Li, 2013).

2.3.4 Unconventional Monetary Policy

When the policy of adjusting policy (official) rate loses its effect, and policymakers can no longer rely on lowering the nominal interest rate in the short term to expand liquidity and stimulate the economy, they have to adopt unconventional tools of monetary such as policy quantitative easing.

Quantitative easing is a kind of MP. When faced with the economic and financial crisis, the central bank quickly reduces the policy interest rate to a historical low point or close to zero，and releases a lot of liquidity directly to the market to promote economic and financial recovery (Mu, 2010).

There are three forms of unconventional MP, including leading the public to anticipate the development of future interest rate policy, expanding the size of the central bank's balance sheet and adjusting the structure of the central bank's balance sheet (Bernanke, Reinhart and Sack, 2004).

Another strategy they can use is to target commercial banks and private sector assets in an attempt to spur economic growth by encouraging banks to lend more money. Note that quantitative easing is often referred to as "QE". In quantitative easing, central bank targets the supply of money by buying bond, in particular government bonds. When there is an economic downturn, and the central bank wants to encourage economic growth, it buys bonds from commercial banks and provide them with additional liquidity. This lowers short-term market interest rates and increases money supply. This strategy loses effectiveness when interest rates approach zero; at this point, banks have to implement other strategies to promote economic activity.

2.3.5 Channels of Monetary Policy

When MP is established, it needs some channels to make it effective. Any factors that can affect the availability and price of credit will affect the volume of credit and thus affect the transmission of MP. Usually MP plays a role through bank lending channel, balance sheet channel and asset price channel.

The first one is the bank lending channel, which operates through bank credit. It is based on the mechanism by which monetary authorities influence the costs and the source of funding for banks. As the interest rate on MP falls, the costs of raising funds in the money market will also drop. Therefore, banks can provide more and cheaper loans to households and businesses. Households and companies which may be rated as too risky before MP is been loosened can obtain credit now. Banks' capital channels have similar effects – loose MP has increased banks' profitability, resulting in higher levels of capitalization and higher willingness to grant new loans.

The second one is balance sheet channel, which influences the ability of households and businesses to obtain credit backed by assets. When interest rates fall, the prices of assets that can be used as collateral when applying for loans rise. The fall in interest rates reduce the cost of borrower financing, thus credit demand increases, which will lead to accelerated credit growth, followed by increased consumption and investment demand.

The last one is the asset price channel. Through this channel, in general, we assume that if there is decreasing in policy rates, then there is increasing in asset prices, which will make people feel that they have become richer. Under such circumstances, consumption will rise. For companies, the stock price rises, which means that the capital cost of the company is reduced，because each share can get more money, it makes it easier for companies to get funding.

3 Characteristic of the Interaction of Macroprudential Policy and Monetary Policy

After the financial crisis of 2007, academics and policymakers began to think about the relationship between MPP and MP more deeply. The term of macroprudential has been used since 1970s but people pay more attention to it particularly after the crisis.

MPP and MP can both influence financial system, and they have some common characteristics. The first one is that both of them have macro characteristics, i.e. they use the aggregate view to consider the whole economy. The second one is that they have the counter-cyclical nature, but when comparing with the MP, MPP are more counter-cyclical. And the last one is that they are both important parts of financial policies (Li, 2013).

In this chapter we will describe the background and theoretical basis of the relationship between MPP and MP, i.e. we will write about the interaction of their objectives and instruments. In the end of this chapter, we will present how to design the policy portfolios.

3.1 The Background of Relationship between Macroprudential Policy and Monetary Policy

Initially, MPP was dedicated to address the risks posed by the rapid growth of loans from developing countries. Subsequently, macroprudential policies have been used as guidelines for macroeconomic regulation and supervision. What we should learn from the lesson of the last financial crisis is that price stability does not necessarily ensure the stability of financial system and real economy. Therefore, policy makers have to understand the nature of the relationship between macroprudential and MP and combine them together to achieve defined policy objectives.

After the financial crisis of 2007, the macroprudential concept has been further expanded, and the relationship between finance and real economy was considered by MPP. The purpose of macroprudential regulation is to protect financial sector from

systemic risk and to act counter-cyclically. MP acts counter-cyclically as well, however, micro-prudential regulation could be pro-cyclical, so they might be in a conflict sometimes. Therefor we think that conflict and cooperation exist at the same time.

Moreover, a significant attention has been paid to the deficiencies of the MP when it deals with the problems of financial cycle. At this time, macroprudential framework gradually exceeded the concept of supervision and formed an independent policy.

In the past few decades, there have been four important global economic developments. Firstly, the inflation levels and their volatility have declined. Secondly the cyclical fluctuations of asset prices, credit and investment have increase and financial crises have occurred more frequently. Thirdly, the real economy has been rapidly growing. Lastly, the global trade imbalances have continued to intensify (Li, 2013).

Two of aforementioned developments are considered as a good phenomenon but the other two are not; as we can see in Tab. 3.1.

Tab. 3.1 Four Economic Phenomena

Inflation levels and their volatility have declined.	Good phenomenon
The real economy has been rapidly growing.	
The volatility of asset prices, credit and investment has been increasing. Financial crises have occurred more frequently.	Bad phenomenon
The global trade imbalances have continued to intensify.	

Source: Self-elaboration

In the past, when the financial crisis of 2007 and the subsequent economic crisis broke out, people sought after many reasons explaining it. However, with the continuous revision of MP, the global economy is still experiencing problems. Nowadays, it has been generally accepted that there should be MPP to supplement

("tidy up") for the deficiencies of MP. However, these two policies cannot be combined or replaced by each other because their focus and objectives are different. Although they can cooperate with each other, they also could be in a contradiction (Claudio and Gabrieland, 2016).

For example, there is a risk-taking channel of MP transmission. Through this channel, continuous downward adjustment of interest rates in the period of sustained loose MP will motivate commercial banks to take on more risks and to have an excessive leverage (Borio and Zhu, 2008). Moreover, Borio and Drehmann (2009) think that it is not enough to cope with the cross-sectional dimension of systemic risk, i.e. it is difficult to eliminate the contagion of financial risks. In such a situation, we need to use both policies together to complement each other (Li, 2013).

Moreover, MP can affect the price of assets. Because when people hold an asset, the interest rate is not the profit, but represents the cost for the debtor. When interest rate changes, the cost for debtor changes as well, that will lead to the differences of price of assets. In theory, the rise in asset prices caused by falling interest rates will not cause asset price bubbles. However, in some situations, if there is no proper treatment, the rise of prices could continue, and then create a bubble of assets prices. As a result, systemic risk will accumulate, and the MPP has been designed to eliminate systemic risk (Li, 2013).

3.2 The Interaction of the Policy Objectives

As we know, the main objective of MP is to keep stable inflation and promote economic growth. MPP should ensure the stability of financial markets and reduce the volatility of asset prices. Judging from the current situation, in order to implement regulation, the macroprudential and monetary policies must be properly coordinated mainly because:

- The two objectives are closely linked. As the target of policy, they must fully consider various factors. First of all, the goal of MP is the foundation for MPP，i.e. that MPP is easier to implement when MP was valid. When the objective of MP is achieved, a favorable financial environment is provided, which is conducive to achieving the goal of MPP. On the other hand, the conduction of MP requires the MP

transmission mechanism.

Therefore, the status of commercial banks, financial institutions and financial markets all play key roles. If the financial institutions operate stably, they will be able to provide guarantees for the implementation of MP. Because, when the MP transmission mechanism working, there are some important factors need to be controlled, such as banks' lending rates, bond's price, interest rates and so on, only when the financial institutions are stable, these factors can be controlled easily and let the transmission mechanism more efficient.

- The two objectives affect each other when the MP is not fully implemented. Problems will arise in the macro-economics, leading to increased systemic risks, affecting the fulfillment of MPP goals. The reverse is the same. When the systemic risks are too great, MP will also be adversely affected.
- The two goals are complementary. Reliance only on one policy cannot guarantee the stable operation of the economy. For example, in the management of counter-cyclical issues, only the two can be combined to achieve better results. But sometimes, they are contradictory. This means that contradictions and cooperation exist at the same time. Policy makers need to make the adjustment according to specific goals and actual conditions.

The simultaneous existence of such contradictions and cooperation has forced us to think carefully about their interactions in different phases of the financial and business cycle and to coordinate at the appropriate time (Borio, 2013). We will demonstrate it with the help of the Tab. 3.2. It will help us to understand how to coordinate both policies in different phases of business and financial cycle.

In order to better understand aforementioned table, we should know that the policy mix here is not always optimal, and that when the demand is weak, and the leverage ratio drops, loose MPP will help the transmission of MP, and eliminate pessimistic expectations, stabilize the financial sector and promote economic recovery. However, if the financial sector is too weak, loose MPP may undermine its confidence, caused the failure of MPP.

Because when the financial institutions are relatively vulnerable, loose MPP will make people think that financial institutions are not stable enough and lack of help, they will think that the risk of investment is too large at this time. In reaction, we should increase the CAR of banks and tighten MPP to ensure the operation of MP.

Tab. 3.2 Interaction of Monetary and Macroprudential Policies at Different Phases of Financial and Business Cycle.

	Inflationary pressures		Disinflationary pressures	
	Strong demand	Weak demand	Strong demand	Weak demand
Rapid credit growth	Tightening > IT	Tightening	Easing< IT	Easing
Monetary pol. and rising asset prices	Tightening	Tightening	Tightening	Tightening
Decline in credit and falling asset prices	Tightening	Tightening < IT	Easing	Easing> IT
	Easing	Easing	Easing	Easing

Note: Some combinations are unlikely. The symbols > IT and < IT denote MP responses that are, respectively, stronger and weaker than those needed to attain the inflation target. Green boxes = policies complement each other. Red boxes = policies are potentially in a conflict. Combinations where inflation is close to the target, loans are growing at a reasonable rate and asset prices are at normal levels are not shown in the table, as in these cases the responses of the two policies will be moderate and will not interact significantly.

*Source: Frait, Malovaná and Tomšík (*2015*)*

However, in real life, these two policies are actually very difficult to coordinate, especially when these two policies are implemented by different agencies. For example, when systemic risks and inflation are concerned, systemic risks are not easily revealed. The reason is that inflation is easier to be revealed related to the changes of price level, but we cannot realize the systemic risk as soon as realize the

inflation problem. Monetary authorities often prioritize stable inflation. Different objects of these two policies make it difficult to coordinate them properly.

However, people believe that the use of MPP is the best way to prevent the financial sector from becoming fragile. MP is not effective at this point, especially at the time of credit boom. Because in some certain conditions, there will be some conflicts when the inflation targeting MP want to make the credit stable. For example, the low inflation rate may let the banks or investors think the risk is lower than the average level, and the low risk premium will lead to the increasing of the financial products' price.

These processes will improve the growth of credit. The MP will not to prevent the financial sector from being fragile. In this case, the central bank can set interest rates at a higher level, this change can improve the effectiveness of macroprudential polities (Frait, Malovaná and Tomšík, 2015).

3.3 The Interaction of the Policy Instruments

In general, the main instruments of MP are deposit reserve system, rediscount policy and open market operations. Regarding the MPP, the main tools are: capital requirements, change of the capital structure of financial institutions, regulation for liabilities maturity and capital liquidity, and contingent capital instruments and so on. They are interconnected, but sometimes there are conflicts, how they should be coordinated depends on what the main problems are currently and what the policy objectives are.

Recording to Goodhart's model (2009), under the pressure of future inflation, MP will increase the default rate and thus impose constraints on the leverage ratio that can confirm MP can be used with MPP to control the leverage cycle. And people think the interaction of MP and MPP can not only keep the price level stable, but also can keep the stability of financial markets, and can reduce the systemic risks (Li, 2013).

We want to make a table to compare the instruments of MP and MPP. Results are shown in Tab. 3.3.

Tab. 3.3: Comparing of Monetary Policy Tools and Macroprudential Policy Tools

Policy tools	Action object	Tools´ objective	Final goal
Monetary policy tools	Reserve requirements	Money multiplier	Economic growth Price stability
	Rediscount policy	Money supply	Economic growth Price level stable
	Open market operations	Monetary base	Economic growth Price level stable
Macroprudential policy tools	Leverage ratio	Credit balance	Financial stability
	Loan-to-value ratio	Credit balance	Financial stability
	Excess capital requirements	Credit expansion capacity	Financial stability

Source: Self-elaboration based on Li (2013, p. 245)

Thus, when choosing a MP or MPP tool we should pay attention to the following points:

- MP instruments and MPP instruments should remain relatively independent;
- The aims of MP instruments and MPP instruments should be distinguished, otherwise there could be conflicts in the implementation process;
- A sound information platform should be established to avoid conflicts.

3.4 Policy Portfolio Design

The portfolio of MP and MPP cannot only achieve the goal of price stability and financial stability, but it can improve the effect of policy implementation to a large extent as well.

There are several advantages of these policies´ portfolios:

- The objective of MP and the objective of MPP are closely linked.
- MP and MPP are complementary.
- The interaction between MP and MPP can reduce the policy conflicts.

The requirements for the policy portfolio are as following: it should consider the timing of the policy action; make full use of the interaction between MP and MPP; and avoid the conflicts between MP and MPP (Li, 2013).

When we design the policy portfolio, we should notice that the role of MP should be in the period of macroeconomic reversal (for example: inflation turn into deflation), thus ensuring that the macroeconomic level fluctuates around time axis. It means when macroeconomic level is too high, using the restrictive MP to decrease it; when the level is too low, using the expansionary MP to increase it. The curve of it is almost as same as business cycle. When the macroeconomy is in the contractionary phase of business cycle, the central bank should use expansionary MP to promote economic growth; at the same time, macroprudential regulators should start to reduce the pro-cyclical effects of financial markets and prevent systemic risks.

4 Empirical Analysis of Interaction of Macroprudential Policy and Monetary Policy in China

In this chapter, firstly, we will introduce the conduction of MPP and MP in China, and then we will input the related macroeconomic data and the data of policy instruments. Moreover, we will make the empirical analysis of the interaction of the MPP and the MP in China from 2007 to 2016 and summarize the results.

4.1 Macroprudential Policy and Monetary Policy in China

In this part, we will introduce basic information about MPP and MP in China, include the MPP and MP in China's development, status, and future trends. More importantly, we will introduce the so-called double-pillar framework.

4.1.1 Macroprudential Policy in China

As we all know, since the 1970s, the Chinese economy has entered a period of rapid development. However, due to the Asian financial crisis in 1997 and the world financial crisis in 2008, China has to pay attention to macroprudential policies. And China joined the Basel Committee, and began a careful and detailed study on MPP in 2009.

In addition, Xiaochuan Zhou, governor of the central bank of China, believes that one of the main reasons to implement macroprudential policies is that, there are too many pro-cyclical factors in the process of conventional macroeconomic operations. For example, people usually use the situation in the market as the basis for their own judgment, whether it is an individual or an institution. When a person earns money in the stock market, he will certainly want to make more money in stock market, even willing to use leverage and take more risk. In the stock market, if everyone is optimistic, then the stock price is not easy to fall, because in this case, there are no people will sell their stock at a lower price.

If everyone in the market does this, the pro-cyclicality of the market will become very strong. Resulting the economy has the period of “good times”, the stock market is good, and the companies are more profitable, if there is no counter-cyclical policy, it is very dangerous.

In 2011, the Central Bank of China officially implemented a dynamic adjustment mechanism for differential reserves, which means setting different reserve requirements ratios according to the CAR and capital quality of each financial institution.

This mechanism aims to match the pace of expansion of financial institutions with the size of capital, thus, to reduce the possibility of systemic risk materialization. This mechanism is very advanced throughout the world. It does not only set the requirements for capital adequacy for each financial institution individually from the perspective of MPP, but also takes into account the actual situation of every financial institution.

It also requires each financial institution to design expansion plans according to its own capabilities so as to avoid the excessive growth of credit and the accumulation of systemic risks (Li, 2013).

In 2016, the Central Bank of China upgraded this mechanism to MPA, further, it incorporated more financial activities into its management scope, and implemented counter-cyclical adjustments. The regulatory objectives of this system include capital and leverage, assets and liabilities, liquidity, pricing, asset quality, foreign debt risk, implementation of credit policies, etc. Among them, capital is the core of this evaluation system (Zhou, 2017).

In 2017, the Central Bank of China proposed a double-pillar framework, which means a financial management system is based on MPP and MP. According to Gang Yi, deputy governor of the Central Bank of China, the double-pillar framework has two functions. The first one is to maintain the stability of the currency value and the second one is to maintain the stability of the financial system.

4.1.2 Monetary Policy in China

Unlike other countries' monetary policies, China's MP is not loose, tight, or neutral. Chinese call it 'steady'. Its meaning is to maintain a moderate growth of the money supply and to support the sustained, stable, and healthy development of the national economy on the premise of stabilizing the currency value, preventing financial risks, and improving the quality of loans. It includes both prevention of

inflation and prevention and deflation (Zhou, 2012).

China has its own problems. As a developing country, China's per capital income is low, and there is a lot of room for improvement. It is in a period of rapid development. The enthusiasm of each institution and individual is very high, so it is prone to be overly optimistic. This means that most people are looking forward to more relaxed MP and easier access to loans.

However, this has created a potential inflationary pressure and the amplitude of business cycle is higher. This means that economic development is too rapid, which leads to the accumulation of systemic risks and it is easy to lose rational judgment in the sustainable development of the economy (Zhou, 2012).

As a developing country, China's degree of marketization is not as good as that of developed countries. This means that the market itself is not strong enough and the government should play a greater role. Therefore, China's MP needs to consider more factors and continue to improve MP to meet the regulatory needs of the market.

In this case, the single target system is not suitable for China. China adopted a multiple-target system. The objectives of China's MP have four parts: firstly, to maintain a low inflation rate, secondly, to ensure the healthy growth of the economy, thirdly, to maintain full employment, and lastly, to have balanced balance of payment i.e. international external equilibrium. In these four goals, the commitment to low inflation is the most important (Yi, 2017).

All in all, China's MP is very cautious. It is neither willing to be too loose nor willing to be too tight. As a developing country and at the same time a big country, China's MP must take into consideration each side. It can neither develop too slowly nor develop too fast. At the same time, it needs to stay calm during the development and prevent possible risks. This is a challenge for China.

4.1.3 Double-pillar Framework in China

The double-pillar framework is a new term and was proposed by China in 2017. The double-pillar framework refers to a system that use the MPP and MP as a core policy. In this system, MPP and MP have the same status, they are equally important.

For China, the two-pillar framework is very important. For the world, this is a

new attempt, which means the term “macroprudential” was firstly used in the 1970s, however, the policy started to form later on, and now MPP become as important as MP. This process only took half a century. Of course, if the MPP wants to fulfill its mission, it needs the cooperation of every financial institution and individual in the entire financial system.

Why does China necessarily need a double-pillar framework? Fan (2017) thinks that there are three reasons. Firstly, in the past, every financial crisis has impacted on the traditional regulatory framework and inspired people. For example, the Great Depression in the 1930s prompted the birth of Keynesianism. After the stagflation in the 1970s, economists rethought the role of MP that the main objectives of MP should be to stabilize prices and prevent inflation.

However, after the financial crisis happened in 2007, people realized that price stability does not necessarily ensure financial stability. The development of financial markets changed the demand for MP, especially because of the globalization of finance, more assets were exposed to the same risks, resulting in the contagiousness of market risks becomes stronger and systemic risks are more likely to accumulate. In this case, relying solely on MP cannot solve this problem. However, macroprudential policies can well solve systemic risk issues. Finally, a double-pillar framework has been formed.

Secondly, due to the expansion of the financial markets, business transactions between financial institutions have become more frequent. This has led to the exposure of more financial institutions´ assets to the same risks and increased the contagion of systemic risk.

Due to the innovation in the financial markets, the flow of funds has become faster, the channels have become more complex, and the scale has become larger. Under such circumstances, the previous MPP can no longer meet people's needs. What we need is more stringent MPP with more extensive supervision and greater intensity of supervision.

Thirdly, the irrational behavior of the market participants expands the pro-cyclicality of the markets. We have already mentioned the “herd effect”, which

means that when people make decisions, they will change their decisions based on the judgment of the people or leaders around them. When some people are optimistic, it often leads to more optimism at the markets, and vice-versa. Compared with the past, today's financial markets are more and more developed, the herd effect is more obvious, and lots of market behavior has been strengthened, so we need a stronger MPP.

To sum up, the formation of the two-pillar framework is mainly due to the fact that the development of the financial markets has led to a stronger market demand for macroprudential policies. Of course, the double-pillar framework is a new system, and everything needs to be tested in practice.

4.2 Macroeconomic Variables in China

In this part, we will describe the general situation of the Chinese economy from 2007 to 2016. We describe China's economy by describing GDP, growth rate of GDP, inflation rate and volume of provided credit.

The reason for choosing GDP is simple, because it represents the total value of a country's domestic output of goods and services in each year. The more value it created, the economy's situation is better. Further, we choose inflation rate because it is one of the main objectives of MP, and it is an important indicator which measures the price level development.

The volume of credit will be affected by MP and MPP. When the banks' asset structure is adjusted, the ability of banks to provide loans change, and the final volume of credit will also be different.

4.2.1 Description of Gross Domestic Product

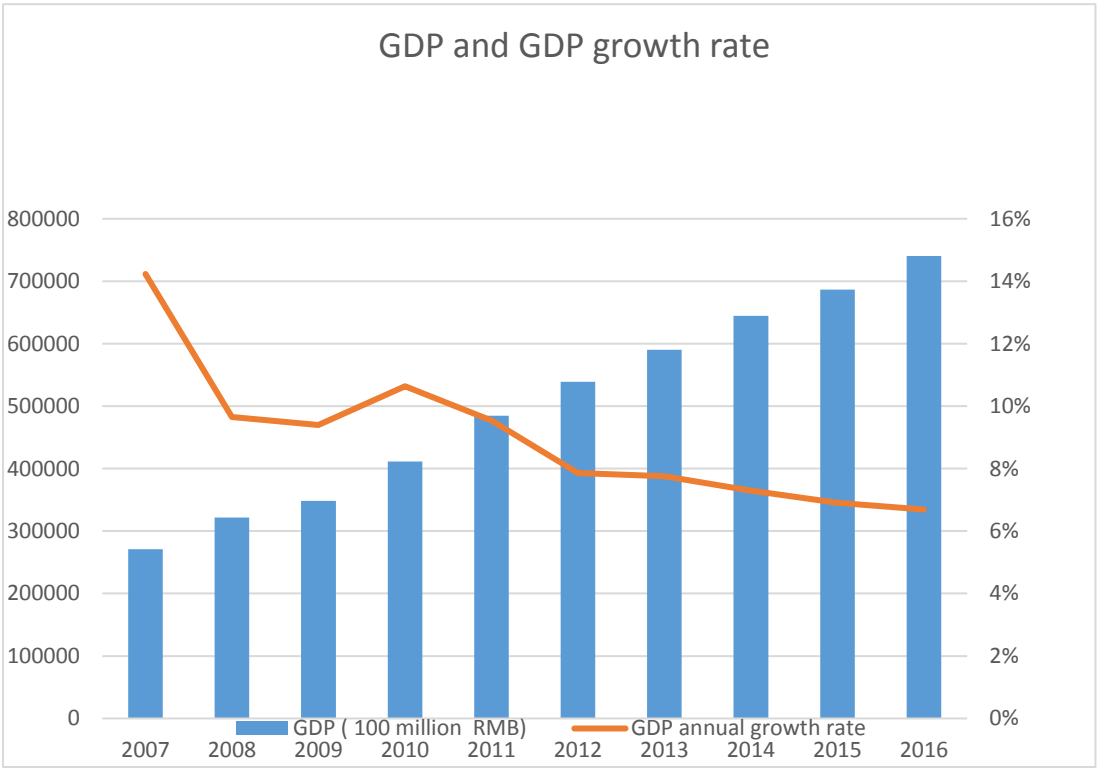
In this part, we will describe the GDP and its growth rate in China from 2007 to 2016 and analyze their development. Tab. 4.1 and Fig. 4.1 show the aforementioned variables.

Tab. 4.1 Gross Domestic Product and its Annual Growth Rate from 2007 to 2016

Time	GDP (In 100 million RMB)	GDP annual growth rate (%)
2007	270844	14.2
2008	321500	9.7
2009	348498	9.4
2010	411265	10.7
2011	484753	9.5
2012	539116	7.9
2013	590422	7.8
2014	644791	7.3
2015	686449	6.9
2016	740598	6.7

Source: National Bureau of Statistics of China (2016), The World Bank (2016)

Figure 4.1 GDP and GDP Annual Growth Rate from 2007 to 2016



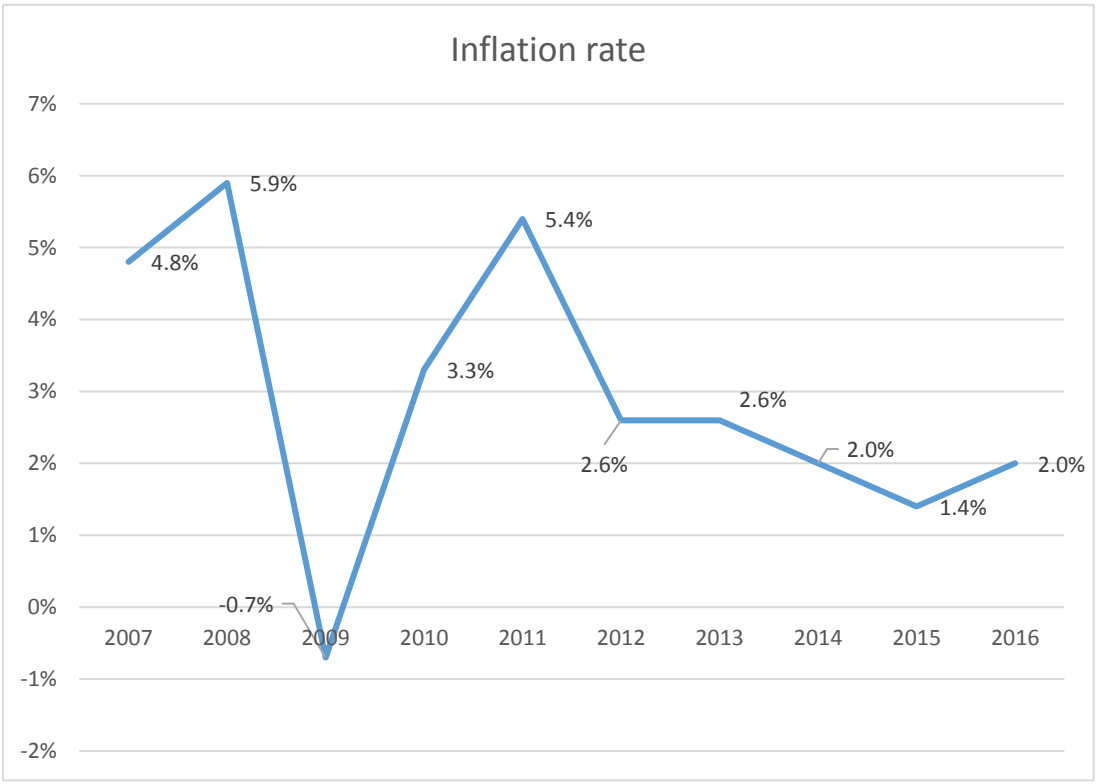
Sources: Self-elaboration

Form Tab. 4.1 and Fig. 4.1, we can see that China's GDP is growing every year, but the GDP annual growth rate is not optimistic. Firstly, in 2008, the growth rate of GDP fell by 4.57 p.p. and then, after 2010, the GDP annual growth rate has been continuously falling. However, in each year after 2011, the rate of decline of GDP growth rate is controlled within 1 p.p. Obviously, it should not be too pessimistic, because even 6.7% of the GDP annual growth rate is very high compared with other developing countries.

4.2.2 Description of Inflation Rate

In this part, we will describe the inflation rate from 2007 to 2016 and illustrate it. The results are displayed in the Fig. 4.2.

Fig. 4.2 Inflation Rate from 2007 to 2016



Source: The World Bank (2016)

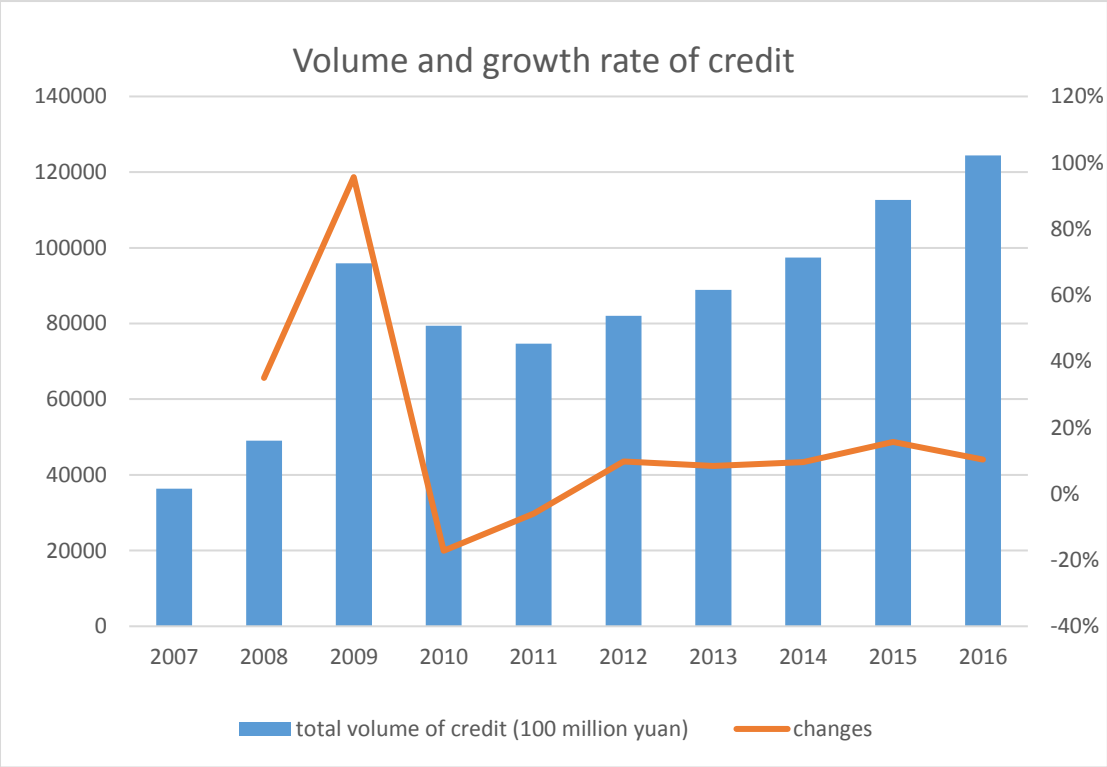
Before the analysis, we need to know that China's inflation target is between 2% and 3%. This was proposed by the Deputy Governor of the Central Bank of China, Yi Gang, in 2008. From Fig. 4.2, we can see that during the period from 2007 to 2011, China's inflation rate fluctuates significantly, reached the highest values in 2008, 5.9%, and in 2009, there was even deflation. The main reason being that, after the global

financial crisis of 2007, people were more likely to put money into banks and were no longer willing to invest.

During the period from 2009 to 2011, the inflation rate increased very rapidly, reaching 5.4% within two years. This is still a higher figure for China, because China's ideal inflation rate is between 2% and 3%. However, after 2011, China's inflation rate has remained below 3%, indicating that the target about inflation rate of MP has been achieved.

4.2.3 Description of Volume of Credit

Fig. 4.3 Total Volume of Credit in China from 2007 to 2016



Source: National Bureau of Statistics of China (2016)

The volume of credit is directly affected by changes in the deposit reserve ratio, and it also It also reflects people's attitude towards risk. When people are optimistic, the volume of credit always tends to increase, when people's expectations for the future are not good, the volume of credit always tends to decrease. Through Fig 4.3, we have found that China's credit volume was growing from 2007 to 2009 and experienced decline from 2009 to 2011. However, since 2011, the volume of credit has been growing at a very steady pace.

4.3 Description and Analysis of Monetary Policy Tools and Macroprudential Policy Tools

In this section, we select the deposit reserve ratio and interest rate as the representative of MP tools. And we also choose adequacy ratio and provision ratio as the selected MPP tools.

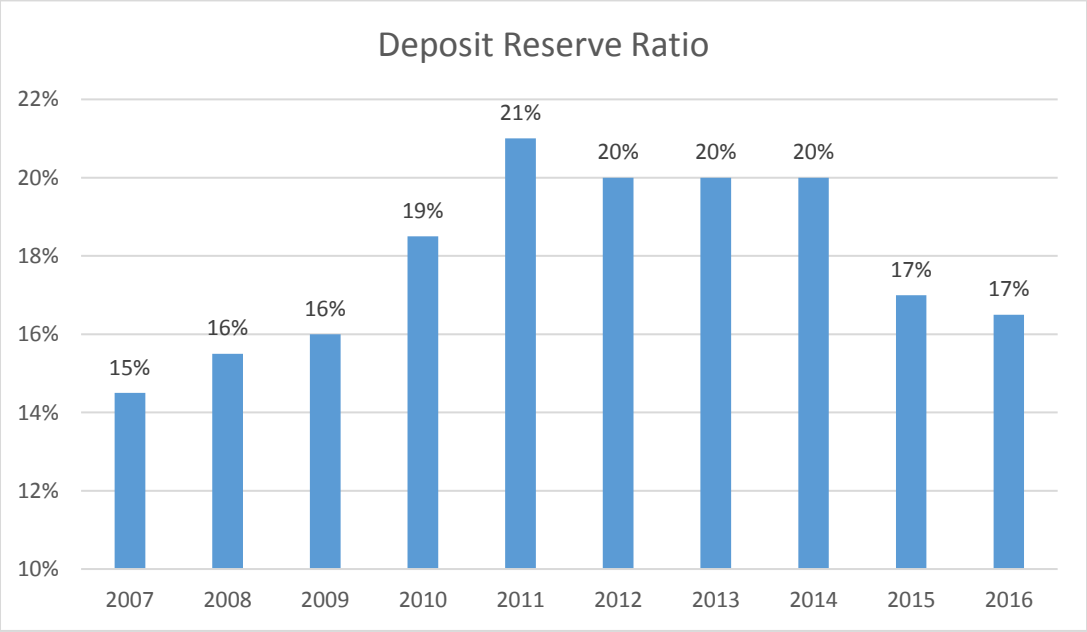
First of all, every time the central bank adjusts interest rates and deposit reserve ratios, it has a purpose. We have mentioned before that deposit reserve ratio is an important tool of MP, it is aimed to ensure commercial banks' solvency and reduce default risks and MP can change the money supply by changing the deposit reserve ratio and change the ability of banks to provide loans by changing the interest rate.

The CAR and provision coverage are also the same. Both of them can change the usage of bank funds and thus influence the ability of banks to provide loans and the amount of money on the market.

4.3.1 Description and Analysis of Monetary Policy Tools

We will describe the situation of deposit reserve ratio and interest rate from 2007 to 2016 in China, and then we will make the analysis of them. The results are shown in Fig. 4.4 and Fig. 4.5.

Fig. 4.4 Deposit Reserve Ratio of China from 2007 to 2016



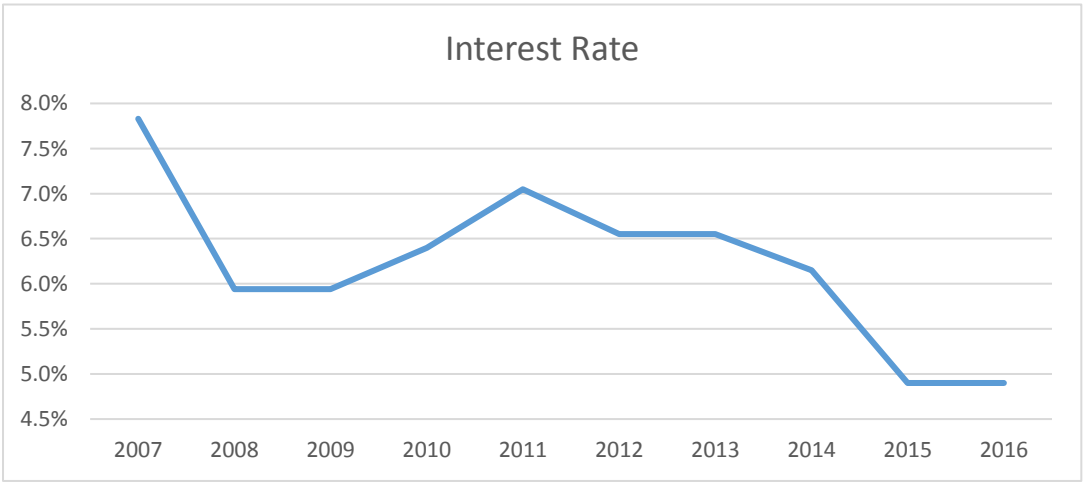
Source: The People's Bank of China (2016)

From the Fig. 4.4 we can see that the changes of Chinese deposit reserve ratio from 2007 to 2016. We note that the deposit reserve ratio reached its highest point in 2011 (21%). In 2007, it was at its lowest value of 14.5%. It is worth mentioning that between 2007 and 2011, the deposit reserve ratio continued to increase, and from 2011 to 2016, the deposit reserve ratio continued to decline, except for 2013 and 2014, when it stayed unchanged.

Based on the actual situation, this is very consistent with the cyclical nature of finance: after experiencing the financial crisis in 2007, the government chose lower value of deposit reserve ratio in order to stimulate the economy, i.e. that. In the process of economic recovery, the deposit reserve ratio was gradually increased, this is in order to prevent the excessive credit expansion and inflation. In this process, we should keep adjusting according to the actual market conditions.

Now, we can easily understand the changes in volume of credit. In 2007, the deposit reserve ratio was very low, banks have more funds to provide loans, which led to an increase in the volume of credit. In the process, the government kept adjusting the deposit reserve ratio in order to control the expansion of credit volume. In 2009, China's credit volume reached its first peak. In 2011, the deposit reserve ratio was as high as 21%, which was the highest value. Since then, the deposit reserve ratio has gradually declined, and the credit volume has gradually increased at a very steady growth rate.

Fig. 4.5 Interest Rate of China from 2007 to 2016



Source：The People's Bank of China (2016)

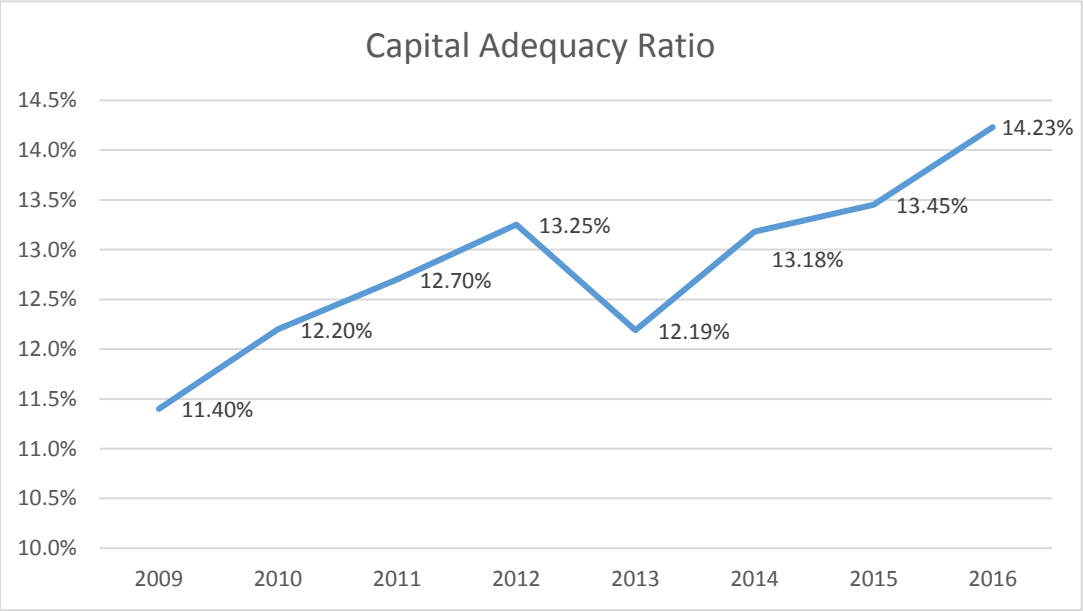
Fig 4.5 shows us the interest rate for loans which have a maturity with more than five years in China from 2007 to 2016. We can see that China's interest rate has been greatly reduced from 2007 to 2008. This is to stimulate the economy and encourage people to consume or invest. This is the same purpose as is in the case of decreasing deposit reserve ratio.

Increasing interest rates gradually after 2008 and gradually decreasing after 2011 are all in line with China's credit volume, which means that when interest rates fall, the demand for credit will increase. But interest rates still can't explain the issues we mentioned before about deflation.

4.3.2 Description and Analysis of Marco-prudential Policy Tools

As we mentioned before, CAR is an important tool for MPP. It represents the ability of commercial banks to take risks themselves. Because China has started to implement MPP from 2009, we only describe and analyze China's CAR from 2009 to 2016.

Fig. 4.6 Capital Adequacy Ratio from 2009 to 2016 in China



Source: Bank of China Insurance Supervision Committee (2016)

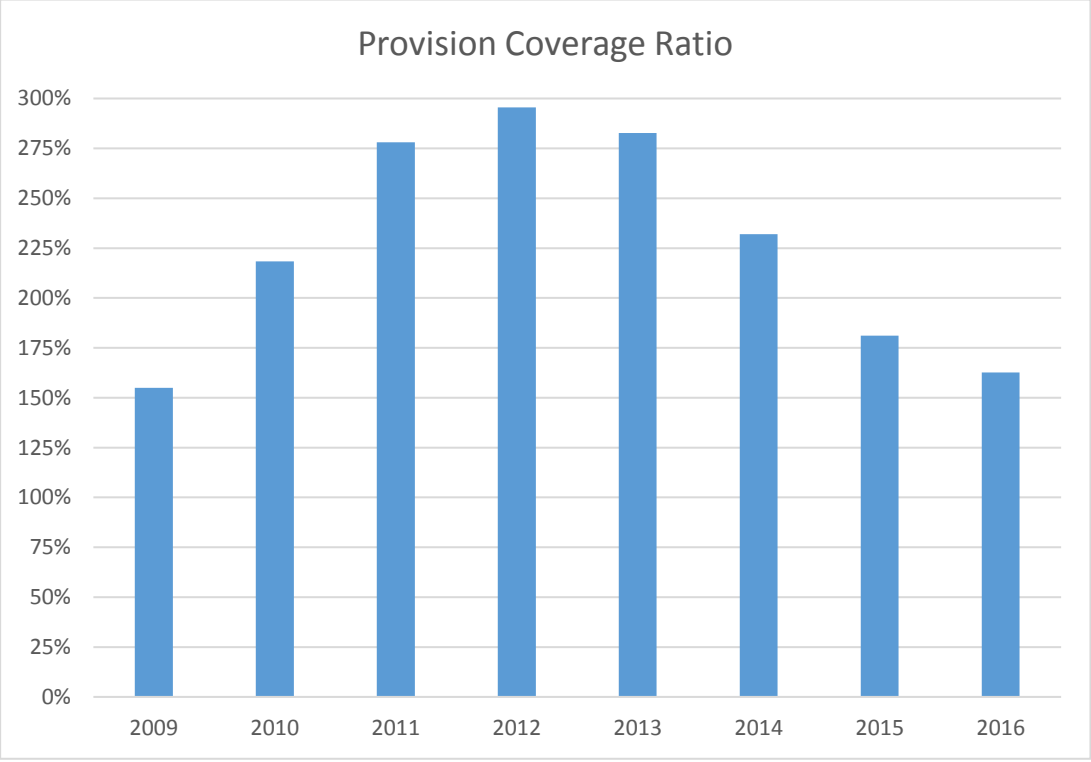
From Fig. 4.6, we have found that China's CAR has been rising, except from 2012 to 2013. the vice president of the Central Bank of China, Yi Gang, believes that the main reason of this situation is that in 2013, China change the structure of core capital to make it smaller, resulting in a decline in capital adequacy ratio. There is

nothing to worry about. As expected, from 2013 to 2016, the CAR has never declined.

This shows that China's MPP is very conservative, and it is trying to increase the ability of banks to take risks. The continuous rise in capital adequacy ratio, even considering the continuous expansion of the bank size, will also affect the bank's credit supply capacity. Therefore, after China began to implement MPP in 2009, the banks increased their CAR and reduced its credit supply capacity in order to meet the requirements of the central bank of China, resulting in a reduction in the volume of credit since 2009.

However, there are some benefits of appearance of MMP. As we mentioned earlier, during the period from 2008 to 2009, the reserve requirement for deposits increased, but there was no change in interest rates, however, considering the time lag in monetary policy, we find that there is a big drop in interest rates from 2007 to 2008. In this case, deposit reserve requirement increased, and interest rate decreased, these can explain why the credit volume will increase so dramatically in 2009.

Fig. 4.7 Provision Coverage Ratio from 2009 to 2016 in China



Source: Bank of China Insurance Supervision Committee (2016)

Provision coverage ratio is one of the tools of MPP. Provision coverage ratio represents the ability of commercial banks to bear NPL, but higher provision coverage means more funds are idle and banks are not allowed to use these funds. This will affect commercial banks' profitability and credit supply capacity because commercial banks need to spend more funds to prepare for bad loans.

In addition, when the profitability of banks declines, banks will be more cautious when they issue loans, which also has a negative effect on the volume of credit. In this section, we will describe the level of provision coverage ratio of Chinese banking sector from 2009 to 2016.

Through Fig 4.7, we found that the change in trend of provision coverage ratio is similar to the change in trend of the deposit reserve ratio. The only difference is that the peak of the deposit reserve ratio is in 2011, and the peak of provision coverage is in 2012.

So far, we have introduced the usage of tool of MP and two tools of MPP. Although their role is different, but all of them will affect volume of credit. In the next section, we will associate them together to study interaction of China's MPP and MP.

4.4 Analysis of Interaction of Monetary Policy and Macroprudential Policy in China

We have observed three policy tools which can affect the credit supply capacity of commercial banks. These are the deposit reserve ratio which is MP tool, and the CAR and provision coverage ratio which are the MPP tools. In addition, we have introduced interest rate, it is a important indicators of MP.

Their goals are different. Firstly, the main objective of the deposit reserve ratio is to ensure commercial banks' solvency and reduce credit risks, and interest rate changes the willingness of people to demand loans by changing the costs (debt burden) of loans, thus, changing the volume of granted credit. The main objective of the CAR is to ensure that commercial banks are able to bear the risks and losses themselves. The main objective of the provision coverage ratio is to ensure that commercial banks can withstand the losses caused by non-performing loans.

However, these tools still have some intersections, because whether it is to increase the ability to repay debt or to bear the loss, it will cost money and make banks more cautions that will affect the volume of credit.

When we analyze these three tools and interest rate separately, we can observe that after the financial crisis, in order to stimulate economic recovery, the Central Bank adopted a lower reserve requirement ratio and achieved results. The volume of credit has increased year by year. However, in 2009, the deposit reserve ratio did not reach the highest value, and still there was a sudden drop in the size of credit.

After that, the deposit reserve ratio has declined year by year, it is in line with the cyclical nature of finance. In terms of MPP, capital adequacy ratios have been rising since their implementation in 2009, except in 2013 when the calculation method changed. The provision coverage ratio, which has a similar trend with the deposit reserve ratio, rose first and then declined, and peaked in 2012.

So why did the volume of credit suddenly rise in 2009? This is because in 2009, Chinese economy has not yet recovered from the financial crisis of 2007. In 2009, China just started to implement MPP. This policy gives investor confidence, investors are believed that the ability of taking risks of financial institutions have increased, and people are more willing to use loans to invest. However, due to MPP and MP have adopted contractionary policies and excessive expansion of credit has led to deflation, for China, excessive credit expansion is the main reason (Yi, 2013).

From 2009 to 2011, both MP and MPP in order to control the volume of credit. So, deposit reserve ratio, interest rate, CAR and provision coverage, they were adjusted in order to reduce the credit volume, and all of these is contractionary policy, they will limit the rise of price level. As a result, deflation has disappeared, and the volume of credit has declined.

After 2012, the deposit reserve ratio and the provision coverage ratio began to decline. The burden on banks was reduced, and the banks' credit supply capacity was supposed to improve. The actual situation was indeed the same, and the credit volume did increase, but the speed of rise in percentage is lower than the period before 2009. This is because of the existence of capital adequacy ratio, unlike other tools, CAR has

never been reduced between 2009 and 2016, except changes in measurement methods in 2013. This effectively limits the ability of commercial banks to expand and prevents them from excessively issuing loans.

We show in Fig. 4.6 that CAR has been rising since 2009, except the year 2013. This limited the bank’s credit supply capacity. Although the deposit reserve ratio and provision coverage ratio have been declining during this period, due to the cooperation of capital adequacy ratio, the growth of credit volume has been very stable, there was no such a rapid growth as in 2008 and 2009.

This is due to the cooperation between MPP and MP, which perfectly guarantees the stable growth of credit volume and increases the bank's ability to resist risks.

Since China has been implementing the MPP for just nine years, there is very little information that can be taken. However, based on the analysis, we show that in China, the cooperation between macroprudential policies and monetary policies has been a problem in the past, but after the formation of the MPA system in2011, the cooperation between MPP and monetary policies has become more complete. Tab. 4.2 summarizes the provided information about interaction between MP and MPP.

Now we summarize the results of our analysis. In Tab. 4.2, it shows us the situation of MMP and MP from 2008 to 2016 in China. And about inflation rate, there are the lowest and highest values of inflation rate of each period, and we judge whether the policy goal is achieved based on whether the inflation rate meets the requirements or not, as we know, the ideal inflation rate is from 2% to 3% in China.

Tab. 4.2 Interaction between Monetary Policy and Macroprudential Policy in China

		2008-2009	Expansionary or Contractionary	2009-2011	Expansionary or Contractionary	2012-2016	Expansionary or Contractionary
MP	Deposit reserve ratio	Increased	Contractionary	Increased	Contractionary	Decreased	Expansionary
	Interest rate	No change	Contractionary	Increased	Contractionary	Decreased	Expansionary
MPP	Capital adequacy ratio	Increased	Contractionary	Increased	Contractionary	Increased	Contractionary
	Provision coverage	Increased	Contractionary	Increased	Contractionary	Decreased	Expansionary
Result	Credit volume	Increased		Decreased		Increased	
	Inflation rate	Decreased (-0.7%, 5.9%)		Increased (-0.7%, 5.4%)		Decreased (2%, 2.6%)	
Target of policies		Failure		Failure		Fulfill	

Source: Self-elaboration

We can find in 2009, when China first started implementing MPP, the cooperation between MP and MPP was not good. In 2009, China adopted contractionary MP and MPP. Although the credit volume has increased a lot, but the growth rate is too fast, which is not conducive to the prevention of systemic risks and has not reached the target inflation rate.

Next, from 2009 to 2011, China still adopted contractionary MP and MPP, and it has limited the ability of commercial banks to provide credit, thereby reducing the volume of credit. Although deflation disappeared, but the inflation rate exceeded the ideal value again. Policy target still have not been achieved. After 2011, China adopted an expansionary MP, which reduce the deposit reserve ratio and interest rate.

About MPP, it adopted contractionary CAR and expansionary provision coverage ratio. Such a portfolio of policies has not only improved the volume of credit, and the growth rate of the credit volume is kept at a stable level, it is no longer as fast as during the period from 2008 to 2009. The most important thing is that

during this period, China's inflation rate target has been achieved and it has remained between 2% and 2.6%.

Therefore, for China, the direction of MP and MMP cannot be exactly the same, that is, they cannot all be expansionary, nor they all be contractionary. They should restrict each other and limit each other. For example, in order to ensure that the volume of credit will increase, and the growth rate cannot be excessive, central bank of China should adopt an expansionary MP, but at the same time, central bank of China must also use contractionary MPP tools to limit the growth of credit volume.

When they are in the same direction, they often have bad results. As in 2008 and 2011, the inflation rate has not reached the target, but after 2011, the inflation rate has been very healthy.

5 Conclusion

After the conducted analysis, we have learned about MPP and MP, and their interaction in China. The objective of this thesis was to make the assessment of the interaction between China's MPP and MP from 2007 to 2016 by using the related economic data and policy indicators.

The first chapter introduces the selected topic. In this chapter we wrote the objective of this thesis and the structures of this thesis.

In the second chapter, we learned about the main objective of MPP, as well as MP's major objectives. We also learned about MPP tools and MP tools. In addition, in the second chapter, we provided the definition of systemic risk.

In chapter three, we understand some of the interaction between MP and MPP. We understand that if used improperly, they will conflict with each other.

In chapter four, we introduced China’s MPP and MP, especially the double-pillar framework which proposed in 2017.We also learned about the development of MPP in China, China’s steady MP, and MPA.

In the chapter five, we made the conclusion of the whole thesis and wrote we had learned from this thesis.

Through research, we found that there is such an interaction between the MPP and MP in China:

When their direction is the same, MPP will hinder the achievement of MP target, that is, inflation rates. For example, from 2008 to 2011, MPP and MP adopted contractionary policy, which led to large fluctuations in inflation and the appearance of deflation. When they are in different directions, MPP will not only not hinder MP but will also help stabilize the inflation rate at very healthy level, Because we can find that after 2011, China's inflation rate is very stable, below 3%.

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List of Abbreviations

MP	Monetary Policy
MPP	Macroprudential Policy
MPA	Macroprudential Assessment System
GDP	Gross Domestic Product
BIS	Bank for International Settlements
SIFIs	Systemically Important Financial Institutions
NSFR	Net Stable Funding Ratio
NPL	Non-Performing Loans
CAR	Capital Adequacy Ratio
RMB	Ren Ming Bi
IT	Inflation Target

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Student's name and surname

List of Annexes

Annex 1: Macroeconomic Situation of China

Annex 2: Monetary Policy Tools

Annex 3: Macroprudential Tools

Annex 1: Macroeconomic Situation of China

	Inflation rate	Total size of credit (100 million yuan)
2007	4.80%	36323
2008	5.90%	49041
2009	-0.70%	95942
2010	3.30%	79451
2011	5.40%	74715
2012	2.60%	82038
2013	2.60%	88916
2014	2.00%	97452
2015	1.40%	112693
2016	2.00%	124372

Source: The World Bank (2016)

Annex 2: Monetary Policy Tools.

	Interest Rate	deposit reserve ratio
2007	7.83%	14.50%
2008	5.94%	15.50%
2009	5.94%	16.00%
2010	6.40%	18.50%
2011	7.05%	21.00%
2012	6.55%	20.00%
2013	6.55%	20.00%
2014	6.15%	20.00%
2015	4.90%	17.00%
2016	4.90%	16.50%

Source：The People's Bank of China (2016)

Annex 3: Macroprodential Tools.

	Adequacy ratio	Provision coverage
2009	11.40%	155%
2010	12.20%	218.30%
2011	12.70%	278.10%
2012	13.25%	295.51%
2013	12.19%	282.70%
2014	13.18%	232.06%
2015	13.45%	181.18%
2016	14.230%	162.61%

Source: Bank of China Insurance Supervision Committee (2016)